

**MASTER DRILLING PROGRAM**

**BROWN COW POD (12 Wells)  
Carbon County, Wyoming**

AR Federal 1491 1-11	AR Federal 1491 3-11
AR Federal 1491 11-11	AR Federal 1491 3-14
AR Federal 1491 11-2	AR Federal 1491 7-11
AR Federal 1491 1-14	AR Federal 1491 7-14
AR Federal 1491 15-11	AR Federal 1491 9-11
AR Federal 1491 15-2	AR Federal 1491 9-14

**1. ESTIMATED TOPS OF IMPORTANT GEOLOGIC MARKERS**

<u>Formation</u>	<u>Shallowest Depth</u>		<u>Deepest Depth</u>	
	<u>Measured</u>	<u>Sub Sea</u>	<u>Measured</u>	<u>Sub Sea</u>
Almond	965	4,900	2,265	5,900
Pine Ridge	1,205	4,660	2,505	5,660
Allen Ridge	1,525	4,340	2,825	5,340
TD	2,025		3,325	

\*See attached list for details.

**2. ESTIMATED DEPTH OF ANTICIPATED WATER, OIL, GAS OR MINERAL FORMATION**

- a) Primary Objective Pine Ridge Methane Gas
- b) Secondary Objective Allen Ridge Methane Gas
- c) Secondary Objective Almond Methane Gas
- d) Several coal seams may be tested for gas producing formations to total depth. All shallow water zones will be protected with casing and cement. Cement will be brought to surface to isolate formations.

**3. MINIMUM BOP REQUIREMENTS (Refer to attached schematics)**

- a) The BOPE shall be closed whenever the well is unattended.
- b) The BOPE shall be pressure tested when initially installed, whenever any seal subject to pressure testing is broken, after repairs, or every 30 days.
- c) Anadarko shall notify the Rawlins BLM office 24 hours prior to the BOPE test.

**4. SUPPLEMENTARY INFORMATION**

- a) The primary objective of this project is to drill, stimulate, and produce coalbed methane gas from the coal seams of the Mesa Verde Group Formations.
- b) Anadarko proposes to test the coal formations.

- c) Stimulation of the perforated coal seams will be done by hydraulic fracturing. Fresh water, gelled water, and/or foam fracturing techniques will be used.

## 5. CASING PROGRAM

Hole Size	Casing Size	Weight	Grade	Joint	Depth Set	New/Used	Collapse	Burst	Tension
12-1/4"	9-5/8"	32.3	H-40	ST&C	0-200 to 350	New	1370	2270	254M
8-3/4"	7"	23	MC-50	LT&C	0-TD	New	3100	3960	273M

### Surface Casing:

- a)  $Burst = 0.052 * MW * TVD(shoe)$   
 $= 0.052 * 10.0 \text{ ppg} * 350'$   
 $= 182 \text{ psi}$   
 Safety Factor = Rating/Burst  
 $= 2270/182$   
 $= 12.5$
- b)  $Collapse = [0.052 * MW * TVD(shoe)] - [Gas Gradient * TVD]$   
 $= [0.052 * 10.0 \text{ ppg} * 350'] - [0.1 * 350']$   
 $= 147 \text{ psi}$   
 Safety Factor = Rating/Collapse  
 $= 1370/147$   
 $= 9.3$
- c)  $Tension = Weight * TVD * [1 - (MW/65.5\text{ppg})]$   
 $= 32.3 * 350' * [1 - 10.0/65.5]$   
 $= 9,580 \text{ lbs.}$   
 Safety Factor = Rating/Tension  
 $= 254,000/9,580$   
 $= 26.5$

Surface casing shall have centralizers on the bottom 3 joints of the casing, starting with the shoe joint.

### Production Casing:

- a)  $Burst = 0.052 * 13 \text{ ppg} * 3325'$   
 $= 2248 \text{ psi}$   
 Safety Factor = Rating/Burst  
 $= 3960/2248$   
 $= 1.76$
- b)  $Collapse = [0.052 * 13 \text{ ppg} * 3325'] - [0.1 \text{ psi/ft} * 3325']$   
 $= 1916 \text{ psi}$   
 Safety Factor = Rating/Collapse  
 $= 3110/1916$   
 $= 1.62$

c) Tension Weight = 23 lbs/ft \* 3325' \* [1-(13 ppg/65.5 ppg)]  
= 23 lbs/ft \* 3325 \* .8015  
= 61,297 lbs

Safety Factor = Rating/Tension  
= 273,000/61,297  
= 4.45

## 6. MUD PROGRAM

Drilling mud will be used as the circulation medium. A fresh water, polymer, gel drilling mud will be used and visual monitoring will be done from spud to total depth. The anticipated mud weight will be between 8.5-13 ppg. Sufficient quantities of lost circulation material and barite will be available at the well site at all times for the purpose of assuring well control.

## 7. CEMENTING PROGRAM

The following is the proposed procedure for cementing the 9-7/8" surface pipe and 7" long string:

### 9-5/8" Surface Casing:

Lead: Type III Cement with 2% CaCl<sub>2</sub> and .25/sk cello-flake, mixed at 14 ppg, 1.54 cuft/sk yield with 100% excess. 1550 psi compressive strength in 24 hours at 83° F.

The surface casing shall be cemented back to surface. In the event cement does not circulate to surface or fall back of the cement column occurs, remedial cementing shall be done to cement the casing back to surface.

### 7" Production Casing:

Lead: Premium Lite Plus Cement with 1% CaCl<sub>2</sub> and .25/sk cello-flake, mixed at 11 ppg, 3.18 cuft/sk yield, caliper volume plus 10%. 350 psi compressive strength in 48 hours at 114° F.

Tail: Premium Lite II High Strength Cement, mixed at 13 ppg, 1.89 cuft/sk yield, caliper volume plus 10%. 3700 psi compressive strength in 48 hours at 114° F.

Volumes calculated to circulate cement from TD to surface.

## 8. LOGGING PROGRAM

Cores:None

DSTs:None

Logs: From To

GR TDSurface

Resistivity TDSurface Casing

Neutron-Density-CalTD Surface Casing

High Res Pass TBDTBD

**9. PRESSURE DATA, POTENTIAL HAZARDS**

Bottom hole pressures anticipated at 1000-1100 psi

There is no history of hydrogen sulfide gas in the area and none is anticipated.

**10. ANTICIPATED STARTING DATES AND NOTIFICATION OF OPERATIONS**

a) Anticipated Days:

Drilling Days Approximately 7 Days/Well

Completion Days Approximately 2 Days/Well

Testing Days Approximately 7-14 Days/Well

b) Notification of Operations:

Bureau of Land Management

Rawlins Field Office

1300 North Third

P. O. Box 2407

Rawlins, Wyoming 82301

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